

# WILDFIRE THREAT AND THE WILDLAND- URBAN INTERFACE IN FRANKLIN COUNTY, VIRGINIA



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# FIRE AND MAN

- Natural wildfires are inherent to regenerative ecological cycles of forests
- Combination of topographical factors and vegetative fuel loads primarily shape the fire propensity of a region
- Human development in or adjacent to wildfire prone areas results in increased human-wildland conflict; consequent threat to life and property is a prime natural resource management issue

# GOALS

- Identify the fire threat to the wildland-urban interface (WUI) in Franklin County, VA (a forested and populated county in south-central Virginia)
- Use GIS for characterizing the fire threat based on topography, vegetative fuels, fire risk, housing density, and vegetative cover
  - Create a set of maps to identify and visualize fire threatened areas
  - Identify the WUI and classify the wildfire risk

# ANALYSIS COMPONENTS

- Hazards – *factors influencing fire spread and intensity*
  - Topography
    - Slope
    - Aspect
  - Vegetation
    - Fuels
- Risk – *likelihood of fire ignition*
  - Fire History - 1995 to 2001
- Wildland Urban Interface – *human-wildland contact zone*
  - Housing Density
  - Vegetation Cover

# WILDLAND-URBAN INTERFACE / INTERMIX

Based on Federal Register (2001) definition using  
census blocks and National Land Cover Dataset (USGS)

- **Intermix areas** (*housing intermingled with continuous vegetation*)
  - More than 1 housing unit per 40 acres (16 ha) (~6.18 housing units/sq. km.)
  - More than 50% vegetation cover
- **Interface areas** (*housing in vicinity of continuous vegetation*)
  - More than 3 housing units per acre
  - Less than 50% vegetation cover
  - Within 1.5 mi of an area over 1,325 acres (500 ha) and more than 75% vegetation cover
- **Wildland “vicinity”**
  - Areas within 1.5 mi (2.4 km) of wildland vegetation (*California Fire Alliance, 2001*)
  - Approx. distance firebrands can be carried from wildland fire to the roof of a house

# WUI – POPULATION & VEGETATION

## ○ Housing Density

- Number of houses per square kilometer
- Derived from finest demographic spatial scale – census blocks from 2000 U.S. Census data

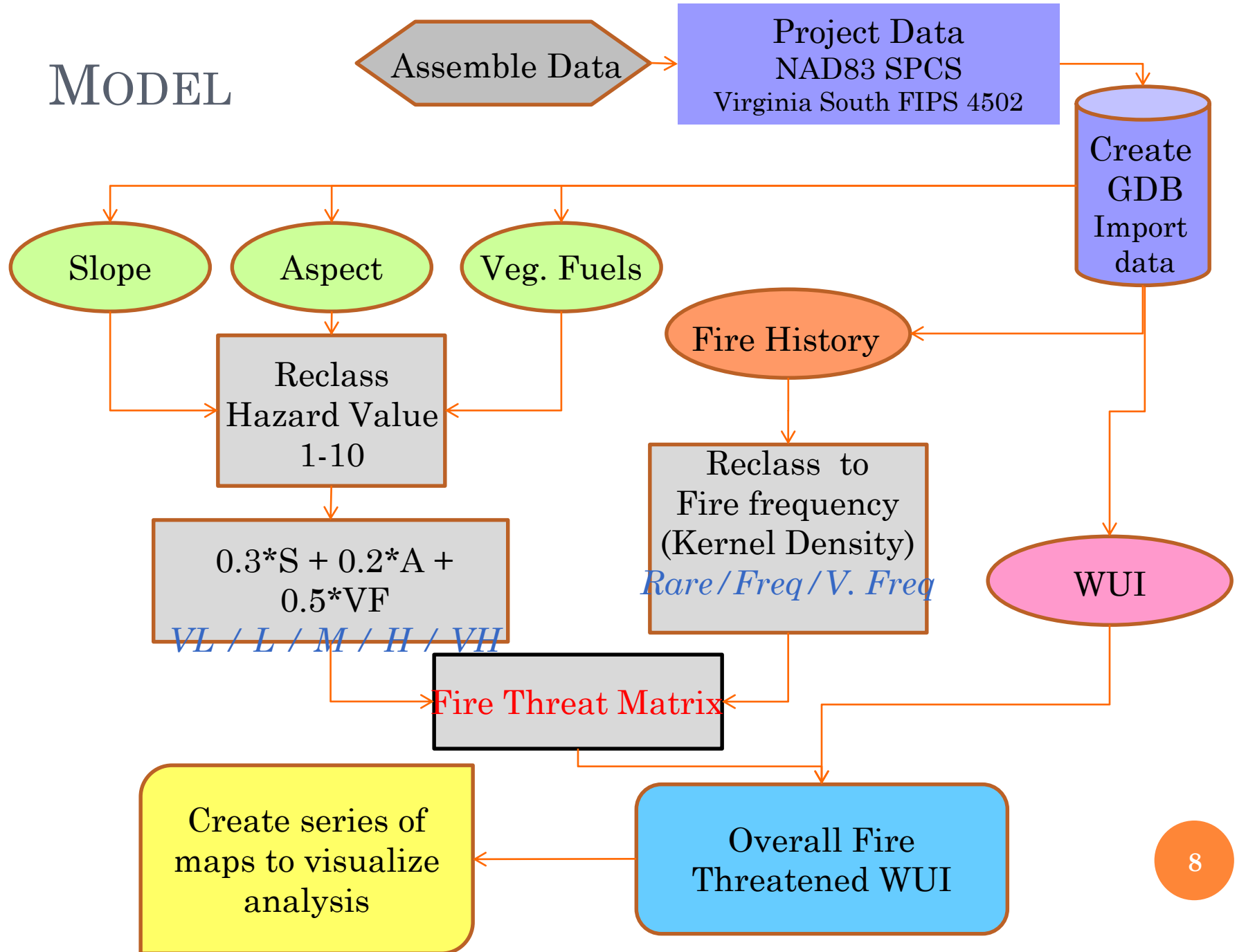
## ○ Vegetation cover

- National Land Cover Dataset (NLCD)
  - 30m raster based on 1992/93 imagery from USGS
  - Wildlands are forests (coniferous, deciduous, mixed), native grasslands, shrubs, wetlands, and transitional lands (clear cut)
  - Exclude orchards, arable lands, pasture.

# DATA SOURCES

Data	Source
Digital Elevation Model	U.S. Geological Survey
Fire incidents (1995 – 2001)	Virginia Dept. of Forestry
13 Anderson Fire Behavior Fuel Models	Landfire.gov
Housing Density	U.S. Census Bureau; SILVIS Lab, Univ. of Wisconsin, Madison
Wildland Urban Interface	SILVIS Lab, Univ. of Wisconsin, Madison
Virginia – state and counties	U.S. Census Bureau

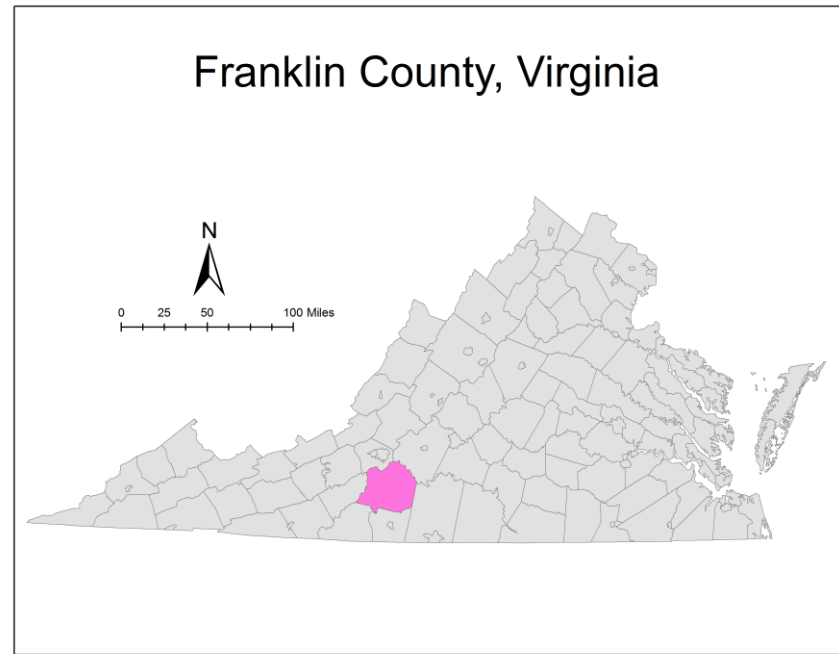
# MODEL





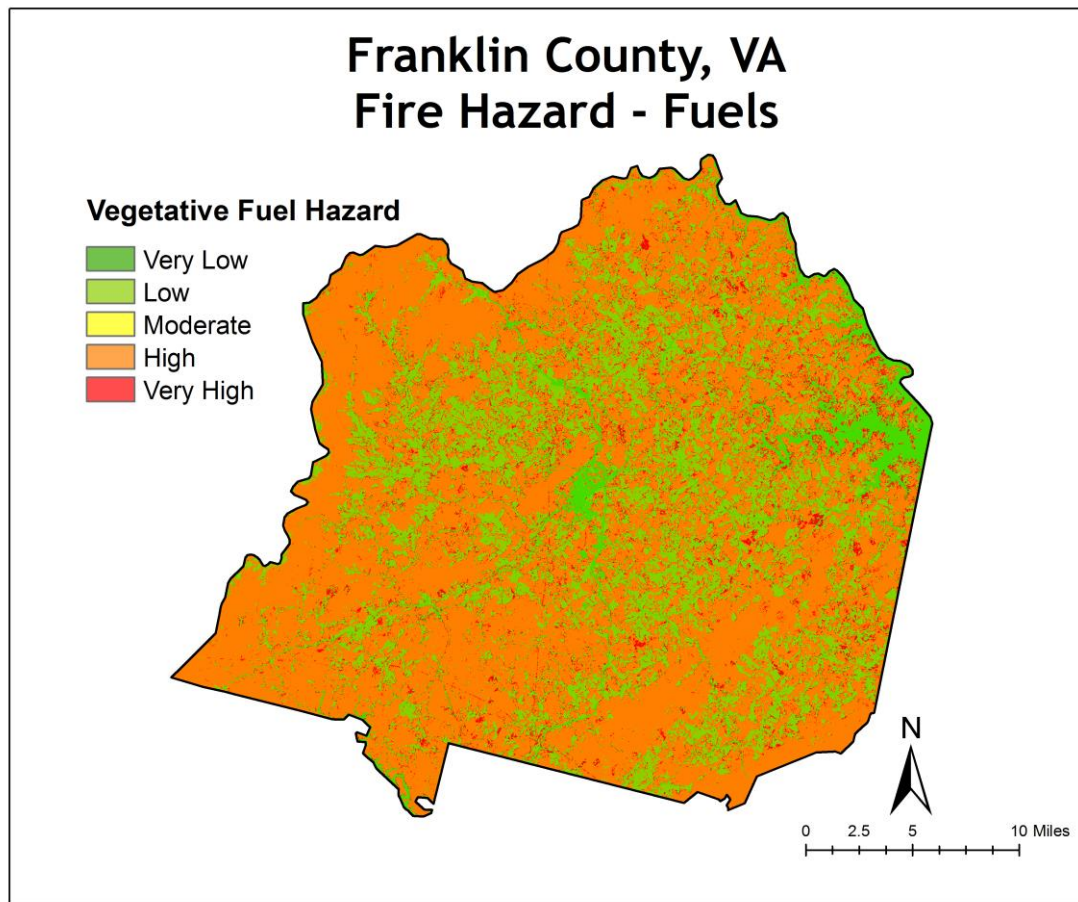
# FRANKLIN COUNTY

- Located in the foothills of the Blue Ridge Mountains
- 7<sup>th</sup> largest county by area: 692 sq. miles of land, 9.5 sq. miles of water
- Elevation varies from 900 feet to 3,200+ ft above sea level
- 63%+ of the land mass is forest cover  
*Source: Franklin County Government*
- 200 fires between 1995 and 2001  
*Source: Virginia Dept. of Forestry*



- 24<sup>th</sup> in population (47,286) out of 95 counties
- 22,717 housing units; average density of 33 per sq. mile (13/sq. km.)  
*Source: US Census 2000*

# WILDFIRE HAZARD – FUELS

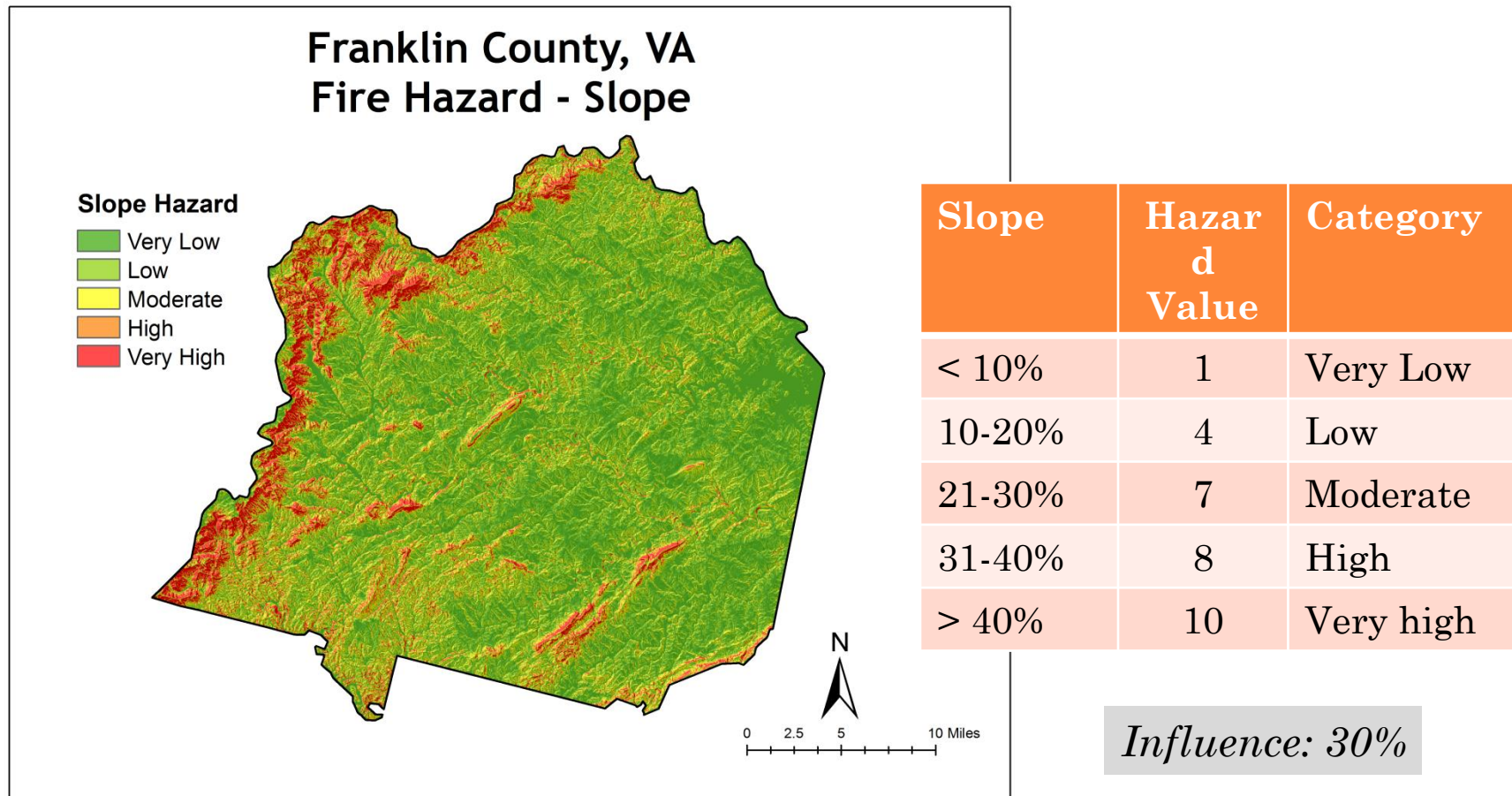


Fuel Behavior Model	Hazard Value	Category
2 - Timber (grass & understory)	10	Very High
5 - Brush (2 feet)	10	Very High
8 – Closed timber litter	8	High
9 – Hardwood litter (long needle pine)	8	High
11 – Light slash	6	Moderate
91 – Urban	1	Very Low
93 - Agriculture	2	Low
98 – Water	0	-
99 – Non burnable, barren	0	-

- Fuels categorized into hazard classes based on 13 Anderson Fire Behavior Fuel Models

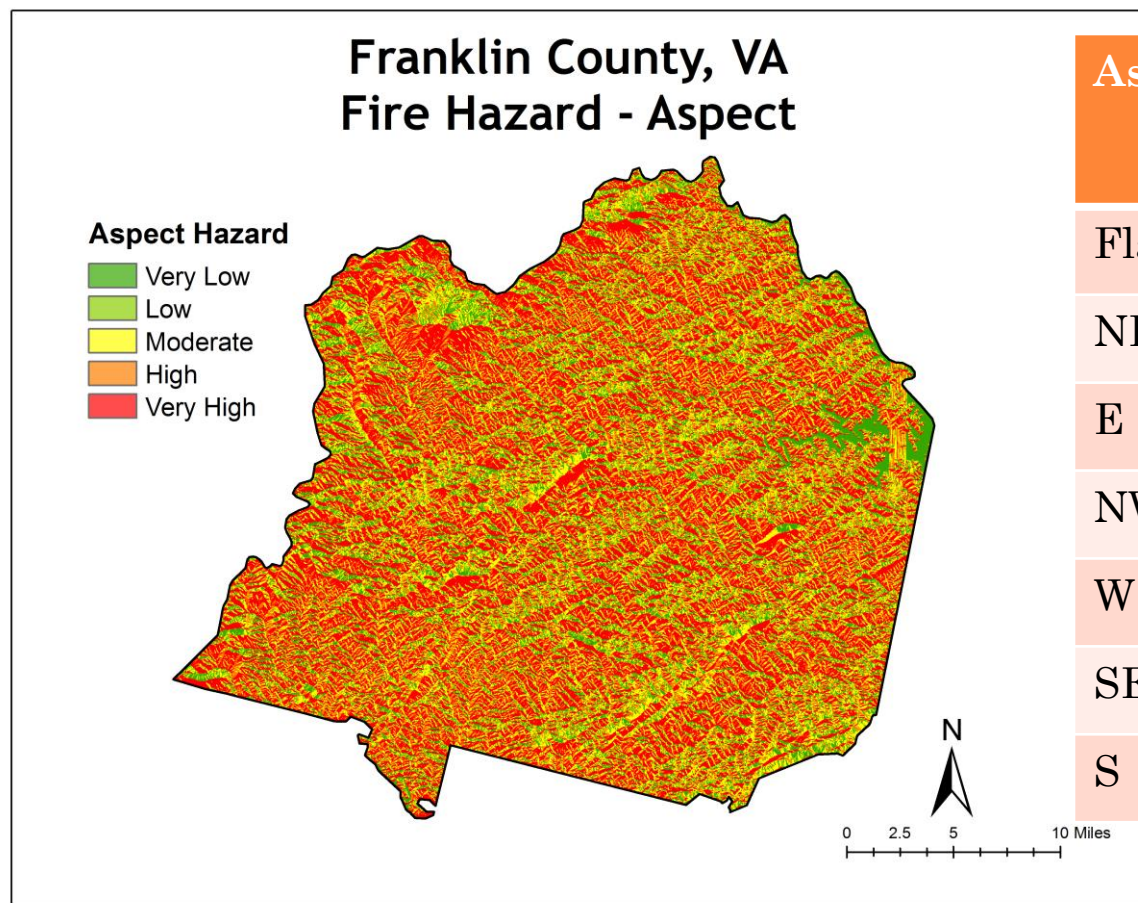
*Influence: 50%*

# WILDFIRE HAZARD – SLOPE MAP



- Slope derived from 30m USGS DEM
- Slope hazard values from National Fire Protection Association (2002)
- Steeper slopes promote uphill fire spread; can impact wind conditions

# WILDFIRE HAZARD - ASPECT

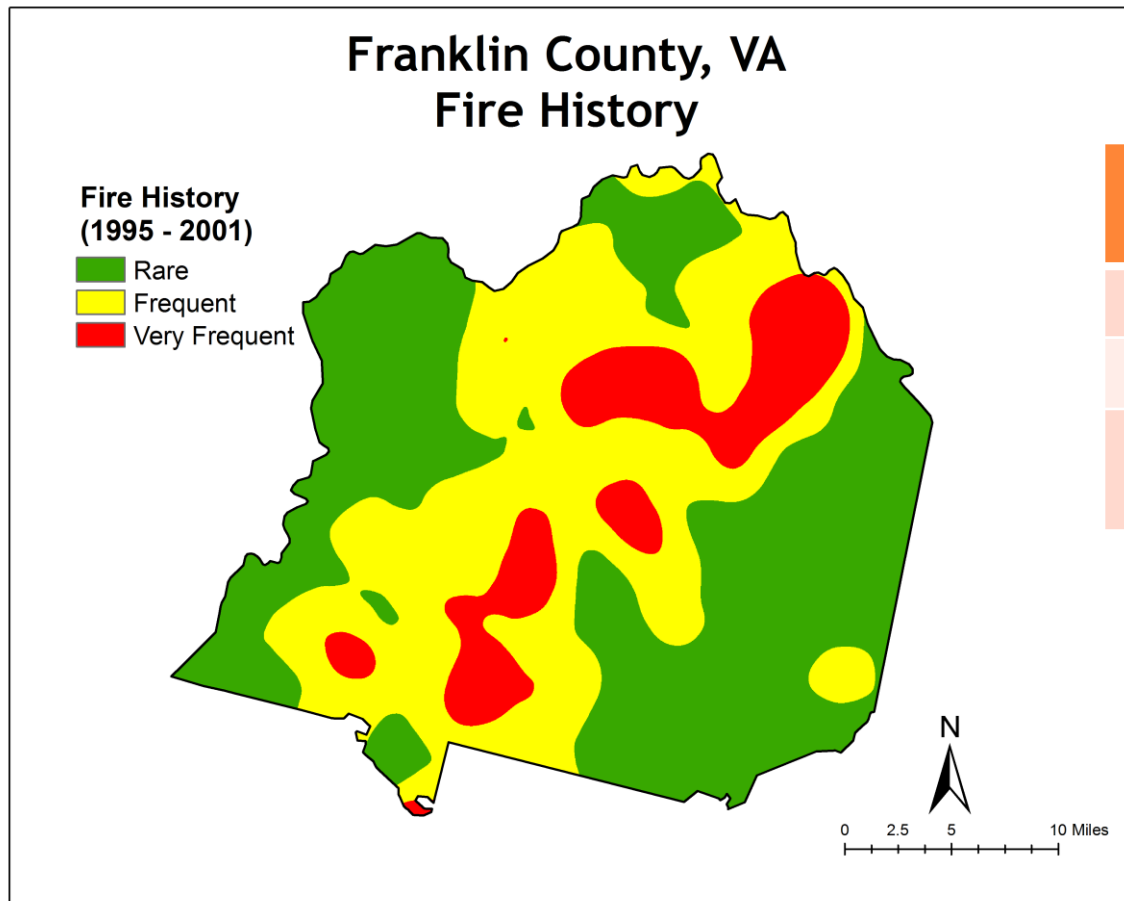


Aspect	Hazard Value	Category
Flat, N	1	Very Low
NE	3	Low
E	4	Moderate
NW	5	Moderate
W	7	High
SE, SW	9	Very High
S	10	Very High

*Influence: 20%*

- Aspect derived from 30m USGS DEM
- South-facing slopes receive more solar energy and are thus drier, and more prone to ignition

# FIRE HISTORY

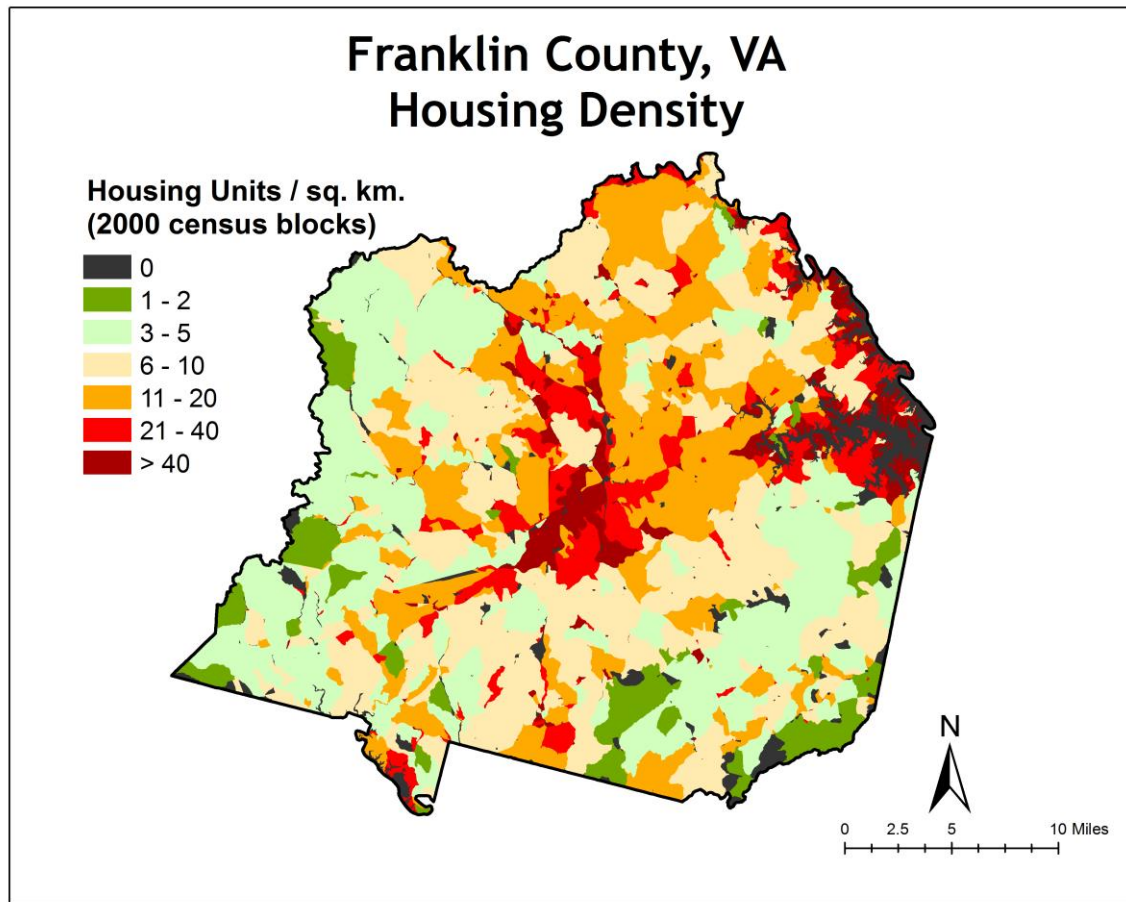


Fire density	Category
0 – 0.09	Rare
0.09 – 0.19	Frequent
> 0.19	Very Frequent

- Fire frequency derived from fire incidents between 1995 – 2001 using Kernel Density with 5km radius

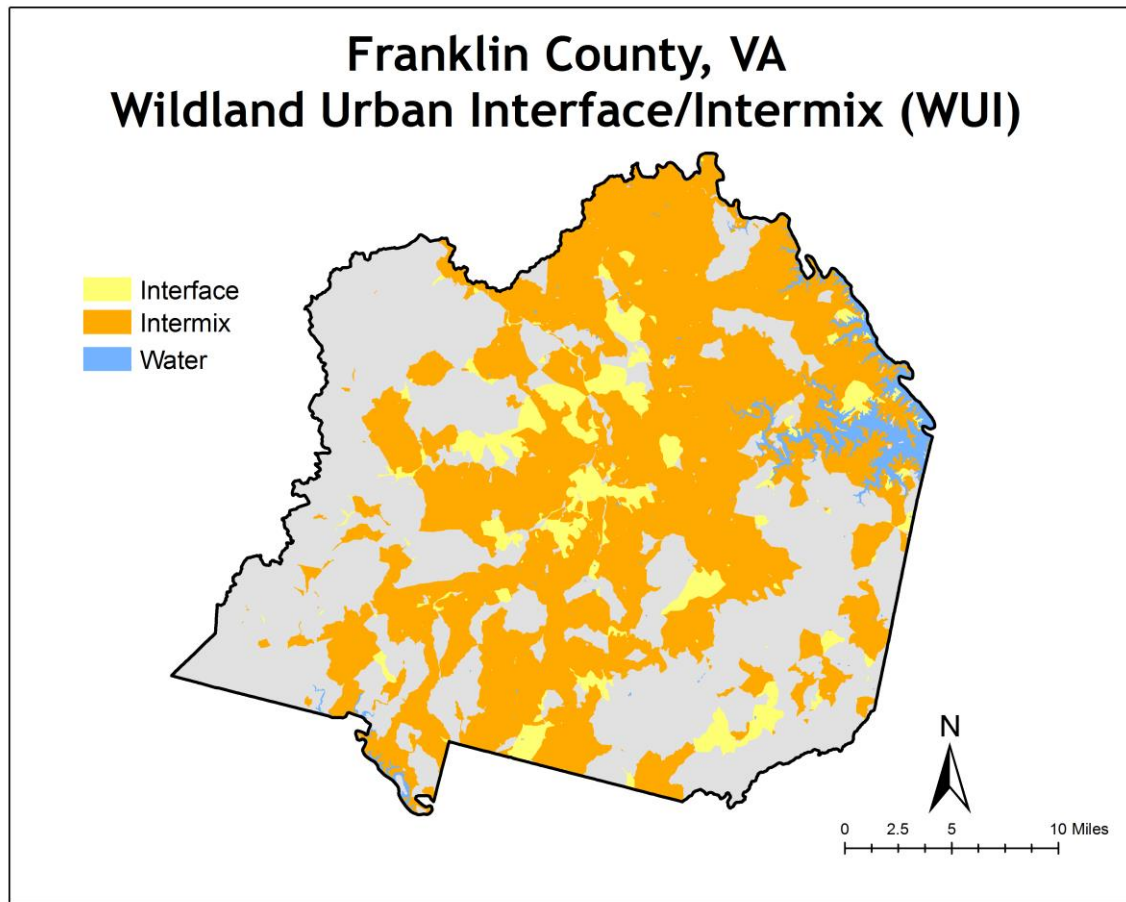


# HOUSING DENSITY



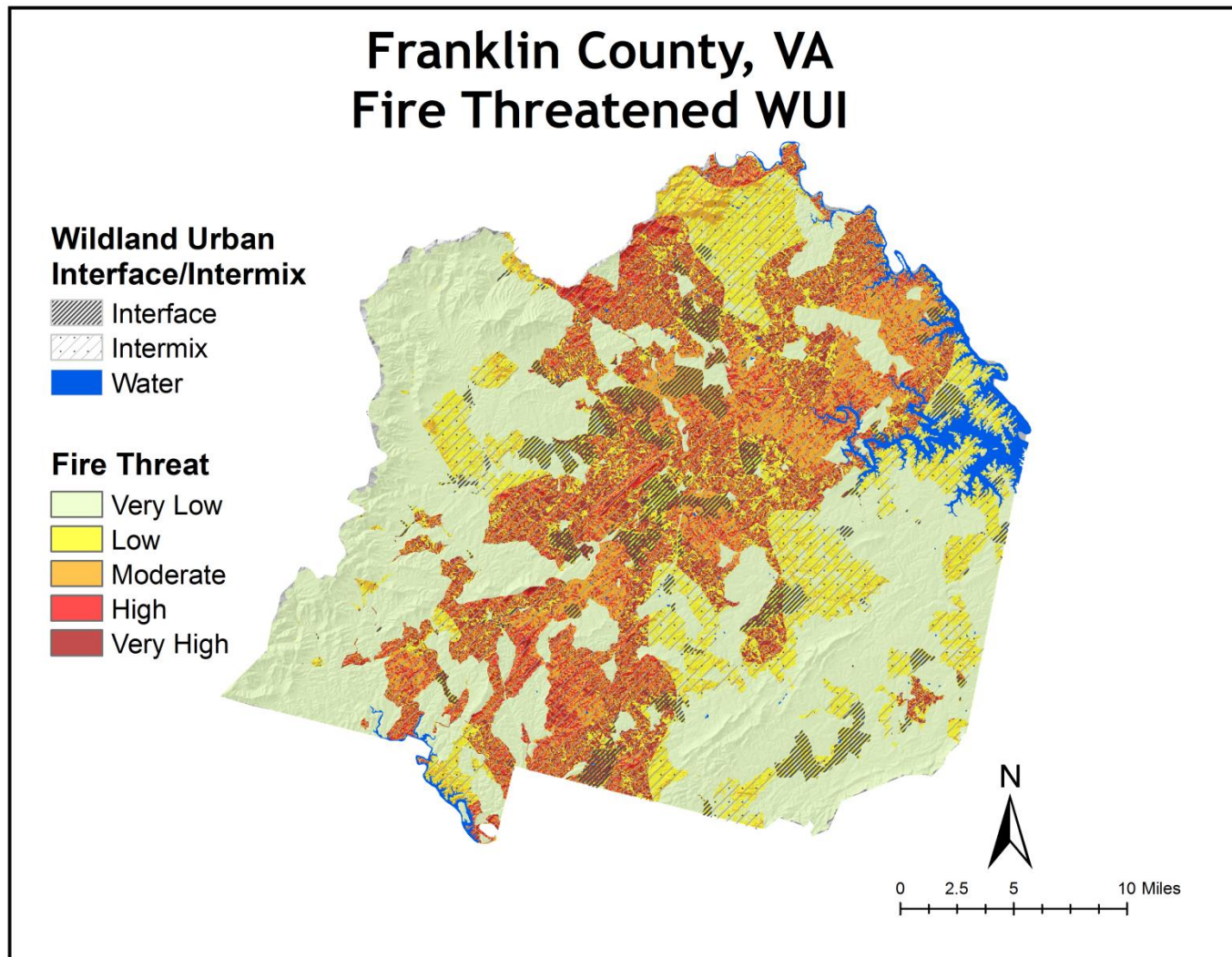
- Housing growth implies increased potential for wildfire ignition in vegetated areas; however, beyond a certain threshold, urbanization results in decreased vegetation fuels (VDoF)

# WILDLAND URBAN INTERFACE/INTERMIX



- Interface:  $\geq 6.18$  housing units/sq. km.;  $> 50\%$  vegetation cover; within 1.5 mi of an area over 1,325 acres (500 ha) and more than 75% vegetation cover
- Intermix:  $\geq 6.18$  housing units/sq. km.;  $> 50\%$  vegetation cover

# FIRE THREATENED WUI





# LIMITATIONS AND FUTURE RESEARCH

- Lightning strikes
- Proximity to roads and railroads
- Climate
- Wind
- Precipitation
- Emergency Response Time

## REFERENCES

- Federal Register / Vol.66, No.3, 2001 (751)
- Landfire.gov
- National Fire Protection Association 1144 (2002 ed.)
- SILVIS Lab, University of Wisconsin - Madison
- U.S. Census Bureau
- U.S. Geological Survey
- Virginia Department of Forestry